

I. AMENDMENTS TO THE CLAIMS:

Please cancel claims 1, 4, 29-43, 45 and 46 without prejudice. Kindly amend claims 2, 3, 5, 7, 8, 10, 13-24, 26 and 27, and add new claims 47-62 as follows.

The following claims will replace all prior versions of claims in the above-captioned application.

Listing of Claims:

1. (Cancelled)

2. (Currently Amended) An isolated DNA molecule comprising a nucleotide sequence that encodes a biologically active protamine polypeptide or functional fragment thereof, wherein the nucleotide sequence is as set out in SEQ ID NO. 32, ~~selected from the group consisting of:~~

~~(a) — nucleic acid sequences encoding amino acid sequences extending from position 9 to position 18, from position 9 to position 20, from position 9 to position 21, from position 9 to position 22, from position 9 to position 23, from position 10 to position 20, from position 10 to position 21, from position 10 to position 22, from position 10 to position 23, and from position 10 to 24 of SEQ ID NO. 2; and~~

~~(b) — nucleic acid sequences as set out in SEQ ID NOS. 13, 15, 17, 19, 21, 23, and 25; and~~

~~(c) — nucleic acid sequences as set out in SEQ ID NOS. 28, 29, 30, 31, and 32.~~

3. (Currently Amended) An isolated DNA molecule providing an expression cassette capable of directing the expression of a biologically active protamine polypeptide or

functional fragment thereof in a suitable host, wherein said expression cassette comprises from 5' to 3':

- (a) a promoter capable of expressing a downstream coding sequence in a suitable host;
- (b) a DNA sequence coding for the expression of a biologically active protamine polypeptide or functional fragment thereof; and
- (c) a 3' termination sequence, wherein the DNA sequence (b) is as set out in SEQ ID NO. 32.

4. (Cancelled)

5. (Currently Amended) Isolated DNA molecule according to claim 2~~claim 1~~, wherein the coding nucleotide sequence is a cDNA, genomic or manufactured DNA sequence.

6. (Previously Presented) Isolated DNA molecule according to claim 3, wherein the coding nucleotide sequence is fused with a suitable signal peptide encoding sequence.

7. (Currently Amended) Isolated DNA molecule according to claim 3, wherein the promoter, or the coding nucleotide sequence, or the promoter and~~and/or~~ the coding nucleotide sequence, sequence(s) are selected to ensure expression in an eucaryotic host.

8. (Currently Amended) Isolated DNA molecule according to claim 3, wherein the promoter, or the coding nucleotide sequence, or the promoter and~~and/or~~ the coding nucleic acid sequence, are selected to ensure expression in a procaryotic host.

9. (Previously Presented) Isolated DNA molecule according to claim 7, wherein the promoter is an inducible promoter.

10. (Currently Amended) A plasmid or vector system comprising one or more DNA molecules according to claim 2 ~~claim 1~~.

11. (Previously Presented) A procaryotic or eucaryotic host cell, seed, tissue or whole organism transformed or transfected with the DNA molecule according to claim 3 in a manner enabling said host cell, seed, tissue or whole organism to express a protamine polypeptide or functional fragment thereof.

12. (Previously Presented) The procaryotic or eucaryotic host cell, seed, tissue or whole organism according to claim 11 selected from the group consisting of bacteria, fungi including yeast, insect, animal and plant cells, seeds, tissues or whole organisms.

13. (Currently Amended) The procaryotic or eucaryotic host cell, seed, tissue or whole organism according to claim 12 that is a procaryotic host cell or whole organism, wherein the procaryotic host cell or whole organism is being a bacterium selected from the group consisting of proteobacteria including members of the alpha, beta, gamma, delta and epsilon subdivision, gram-positive bacteria including Actinomycetes, Firmicutes, Clostridium and relatives, flavobacteria, cyanobacteria, green sulfur bacteria, green non-sulfur bacteria, and archaea.

14. (Currently Amended) The procaryotic or eucaryotic host cell, seed, tissue or whole organism according to claim 13, wherein the procaryotic host cell or whole organism belongs according to claim 13 belonging to the group of proteobacteria selected from the group consisting of Agrobacterium, Rhodospirillum, Rhodopseudomonas, Rhodobacter, Rhodospirillum, Rhodopila, Rhizobium, Nitrobacter, Aquaspirillum, Hyphomicrobium, Acetobacter, Beijerinckia, Paracoccus, Pseudomonas, ammonia-oxidizing bacteria including such as Nitrosomonas, Enterobacteriaceae, and Myxobacteria including such as Myxococcus, with Rhodopseudomonas, Pseudomonas and Escherichia being preferred, and with Rhodopseudomonas palustris, Pseudomonas fluorescens, and Escherichia coli, respectively, being most preferred.

15. (Currently Amended) The procaryotic or eucaryotic host cell, seed, tissue or whole organism according to claim 13, wherein the procaryotic host cell or whole organism belongs according to claim 13 belonging to the group of gram-positive bacteria selected from the group consisting of Actinomycetes and Firmicutes including Clostridium and relatives including such as Bacillus and Lactococcus, with Bacillus subtilis and Lactococcus lactis being preferred.

16. (Currently Amended) The procaryotic or eucaryotic host cell, seed, tissue or whole organism according to claim 13, wherein the procaryotic host cell or whole organism belongs according to claim 13 belonging to the group of flavobacteria selected from the group consisting of Bacteroides, Cytophaga and Flavobacterium, with Flavobacterium such as Flavobacterium ATCC21588 being preferred.

17. (Currently Amended) The procaryotic or eucaryotic host cell, seed, tissue or whole organism according to claim 13, wherein the procaryotic host cell or whole organism belongs according to claim 13 belonging to the group of cyanobacteria selected from the group consisting of Chlorococcales including Synechocystis and Synechococcus, with Synechocystis sp. and Synechococcus sp. PS717 being preferred.

18. (Currently Amended) The procaryotic or eucaryotic host cell, seed, tissue or whole organism according to claim 13, wherein the procaryotic host cell or whole organism belongs according to claim 13 belonging to the groups of green sulfur bacteria or green non-sulfur bacteria selected from the group consisting of Chlorobium and Chloroflexaceae includingsuch as Chloroflexus, respectively, with Chlorobium limicola f. thiosulfatophilum and Chloroflexus aurantiacus, respectively, being preferred.

19. (Currently Amended) The procaryotic or eucaryotic host cell, seed, tissue or whole organism according to claim 13, wherein the procaryotic host cell or whole organism belongs according to claim 13 belonging to the group of archaea selected from Halobacteriaceae includingsuch as Halobacterium, with Halobacterium salinarum being preferred.

20. (Currently Amended) The procaryotic or eucaryotic host cell, seed, tissue or whole organism according to claim 12 that is an eucaryotic host cell or whole organism that is according to claim 12 being fungi including yeast selected from the group consisting of Ascomycota including Saccharomycetes includingsuch as Pichia and Saccharomyces, and

anamorphic Ascomycota including *Aspergillus*, ~~with *Saccharomyces cerevisiae* and~~
Aspergillus niger being preferred.

21. (Currently Amended) The procaryotic or eucaryotic host cell, seed, tissue or whole organism according to claim 12 that is an eucaryotic host cell that is according to claim 12 being an insect cell selected from the group consisting of SF9, SF21, *Trychoplusiani* and MB21.

22. (Currently Amended) The procaryotic or eucaryotic host cell, seed, tissue or whole organism according to claim 12 that is an eucaryotic host cell that is according to claim 12 being an animal cell selected from the group consisting of Baby Hamster Kidney (BHK) cells, Chinese Hamster Ovarian (CHO) cells, Human Embryonic Kidney (HEK) cells and COS cells, ~~with NIH 3T3 and 293 being most preferred.~~

23. (Currently Amended) The procaryotic or eucaryotic host cell, seed, tissue or whole organism according to claim 12 that is and eucaryotic host cell that is being a plant cell, seed, tissue or whole organism selected from the group consisting of eucaryotic alga, embryophytes comprising *Bryophyta*, *Pteridophyta* and *Spermatophyta* including such as *Gymnospermae* and *Angiospermae*, wherein *Angiospermae* include the latter including *Magnoliopsida*, *Rosopsida*, and *Liliopsida* ("monocots").

24. (Currently Amended) A method of transforming or transfecting a procaryotic~~procaryotic~~ or eucaryotic host cell, seed, tissue or whole organism according to ~~claim 11~~ with a DNA molecule in a manner enabling said host cell, seed, tissue or whole

organism to express a protamine polypeptide or functional fragment thereof, wherein the DNA molecule provides an expression cassette capable of directing the expression of the biologically active protamine polypeptide or functional fragment thereof in the host cell, wherein said expression cassette comprises from 5' to 3'

(a) a promoter capable of expressing a downstream coding sequence in a suitable host;

(b) a DNA sequence coding for the expression of a biologically active protamine polypeptide or functional fragment thereof; and

(c) a 3' termination sequence, wherein the DNA sequence (b) is as set out in SEQ ID NO. 32, in order to yield transformants or transfectants capable of expressing thea protamine polypeptide or functional fragment thereof, the method comprising the step of:

(i) providing the procaryotic or eucaryotic host cell, seed, tissue or whole organism' and

(ii) performing a transformation or transfection of said host cell, seed, tissue or whole organism with thea DNA molecule according claim 3 to any of claims 3 to 9, or with a plasmid or vector system according to claim 10.

25. (Previously Presented) A transformed or transfected host cell, seed, tissue or whole organism represented by or regenerated from transformants or transfectants yielded according to claim 24.

26. (Currently Amended) Method for the production of a biologically active protamine polypeptide or functional fragment thereof, comprising the steps of:

(a) culturing a transformed or transfected host cell, seed, tissue or whole organism represented by or regenerated from transformants or transfectants according to claim 25 in culture medium under suitable conditions allowing production of said polypeptide or functional fragment within said host; and, optionally,

(b) isolating said polypeptide or functional fragment from said host or from its the culture medium, wherein the transformants or transfectants are yielded by transforming or transfecting a procaryotic or eucaryotic host cell, seed, tissue or whole organism with a DNA molecule in a manner enabling said host cell, seed, tissue or whole organism to express said protamine polypeptide or functional fragment thereof, wherein the DNA molecule provides an expression cassette capable of directing the expression of the biologically active protamine polypeptide or functional fragment thereof in the host cell, wherein said expression cassette comprises from 5' to 3'

(i) a promoter capable of expressing a downstream coding sequence in a suitable host;

(ii) a DNA sequence coding for the expression of said biologically active protamine polypeptide or functional fragment thereof; and

(iii) a 3' termination sequence, wherein the DNA sequence (b) is as set out in SEQ ID NO. 32, in order to yield transformants or transfectants capable of expressing the protamine polypeptide or functional fragment thereof, wherein the transformants are yielded by

(1) providing the prokaryotic or eucaryotic host cell, seed, tissue or whole organism; and

(2) performing a transformation or transfection of said host cell, seed, tissue or whole organism with the DNA molecule according claim 3.

27. (Currently Amended) Method according to claim 26, wherein said transformed or transfected host cell is selected from prokaryotes, ~~with Rhodospirillum rubrum, Pseudomonas fluorescens, and Escherichia coli being preferred,~~ and wherein said polypeptide or functional fragment is isolated after induction of a log phase culture with a suitable inducing agent.

28. (Previously Presented) Method according to claim 27, wherein said polypeptide or functional fragment is isolated until said host cell re-enters log phase.

Claims 29-43 have been cancelled.

44. (Withdrawn) A prokaryotic or eucaryotic host cell, seed, tissue or whole organism transformed or transfected with the plasmid or vector system according to claim 10

in a manner enabling said host cell, seed, tissue or whole organism to express a protamine polypeptide or functional fragment thereof.

45. (Cancelled)

46. (Cancelled)

47. (NEW) The procaryotic or eucaryotic host cell, seed, tissue or whole organism according to claim 14, wherein procaryotic host cell or whole organism belongs to the group of proteobacteria selected from the group consisting of Rhodopseudomonas, Pseudomonas and Escherichia.

48. (NEW) The procaryotic or eucaryotic host cell, seed, tissue or whole organism according to claim 47, wherein procaryotic host cell or whole organism belongs to the group of proteobacteria selected from the group consisting of Rhodopseudomonas palustris, Pseudomonas fluorescens, and Escherichia coli.

49. (NEW) The prokaryotic or eucaryotic host cell, seed, tissue or whole organism according to claim 15, wherein the procaryotic host cell or whole organism belongs to the group of gram-positive bacteria selected from the group consisting of Bacillus subtilis and Lactococcus lactis.

50. (NEW) The prokaryotic or eucaryotic host cell, seed, tissue or whole organism according to claim 16, wherein the procaryotic host cell or whole organism belongs

to the group of flavobacteria selected from the group consisting of *Flavobacterium* including *Flavobacterium* ATCC21588.

51. (NEW) The procaryotic or eucaryotic host cell, seed, tissue or whole organism according to claim 17, wherein the procaryotic host cell or whole organism belongs to the group of cyanobacteria selected from the group consisting of *Synechocystis* sp. and *Synechococcus* sp. PS717.

52. (NEW) The procaryotic or eucaryotic host cell, seed, tissue or whole organism according to claim 18, wherein the procaryotic host cell or whole organism belongs to the groups of green sulfur bacteria or green non-sulfur bacteria selected from the group consisting of *Chlorobium limicola* f. *thiosulfatophilum* and *Chloroflexus aurantiacus*.

53. (NEW) The procaryotic or eucaryotic host cell, seed, tissue or whole organism according to claim 19, wherein the procaryotic host cell or whole organism belongs are *Halobacterium salinarum*.

54. (NEW) The procaryotic or eucaryotic host cell, seed, tissue or whole organism according to claim 20, wherein the eucaryotic host cell or whole organism that is selected from the group consisting of *Saccharomyces cerevisiae* and *Aspergillus niger*.

55. (NEW) The procaryotic or eucaryotic host cell, seed, tissue or whole organism according to claim 22, wherein the eucaryotic host cell is an animal cell selected from the group consisting of NIH 3T3 and 293 cells.

56. (NEW) A method of transforming or transfecting a prokaryotic or eucaryotic host cell, seed, tissue or whole organism transformed or transfected with a DNA molecule in a manner enabling said host cell, seed, tissue or whole organism to express a protamine polypeptide or functional fragment thereof, wherein the DNA molecule provides an expression cassette capable of directing the expression of the biologically active protamine polypeptide or functional fragment thereof in the host cell, wherein said expression cassette comprises from 5' to 3'

(a) a promoter capable of expressing a downstream coding sequence in a suitable host;

(b) a DNA sequence coding for the expression of a biologically active protamine polypeptide or functional fragment thereof; and

(c) a 3' termination sequence, wherein the DNA sequence (b) is as set out in SEQ ID NO. 32, in order to yield transformants or transfectants capable of expressing the protamine polypeptide or functional fragment thereof, the method comprising the step of:

(i) providing the prokaryotic or eucaryotic host cell, seed, tissue or whole organism; and

(ii) performing a transformation or transfection of said host cell, seed, tissue or whole organism with the plasmid or vector system according to claim 10.

57. (NEW) A transformed or transfected host cell, seed, tissue or whole organism represented by or regenerated from transformants or transfectants yielded according to claim 56.

58. (NEW) Method for the production of a biologically active protamine polypeptide or functional fragment thereof, comprising the steps of:

(a) culturing a transformed or transfected host cell, seed, tissue or whole organism represented by or regenerated from transformants or transfectants in culture medium under suitable conditions allowing production of said polypeptide or functional fragment within said host; and, optionally,

(b) isolating said polypeptide or functional fragment from said host or from the culture medium, wherein the transformants or transfectants are yielded by transforming or transfecting a procaryotic or eucaryotic host cell, seed, tissue or whole organism with a DNA molecule in a manner enabling said host cell, seed, tissue or whole organism to express said protamine polypeptide or functional fragment thereof, wherein the DNA molecule provides an expression cassette capable of directing the expression of the biologically active protamine polypeptide or functional fragment thereof in the host cell, wherein said expression cassette comprises from 5' to 3'

(i) a promoter capable of expressing a downstream coding sequence in a suitable host;

(ii) a DNA sequence coding for the expression of said biologically active protamine polypeptide or functional fragment thereof; and

(iii) a 3' termination sequence, wherein the DNA sequence (b) is as set out in SEQ ID NO. 32, in order to yield transformants or transfectants capable of expressing the protamine polypeptide or functional fragment thereof, wherein the transformants are yielded by

(1) providing the prokaryotic or eucaryotic host cell, seed, tissue or whole organism; and

(2) performing a transformation or transfection of said host cell, seed, tissue or whole organism with the plasmid or vector system according to claim 10.

59. (NEW) Method according to claim 58, wherein said transformed or transfecting host cell is selected from prokaryotes, and wherein said polypeptide or functional fragment is isolated after induction of a log phase culture with a suitable inducing agent.

60. (NEW) Method according to claim 59, wherein said polypeptide or functional fragment is isolated until said host cell re-enters log phase.

61. (NEW) Method according to claim 59, wherein said transformed or transfected host cell is selected from the group consisting of *Rhodopseudomonas palustris*, *Pseudomonas fluorescens*, and *Escherichia coli*.

62. (NEW) Method according to claim 27, wherein said transformed or transfected host cell is selected from the group consisting of *Rhodopseudomonas palustris*, *Pseudomonas fluorescens*, and *Escherichia coli*.